

# Heuristics Applied in the Development of Advanced Space Mission Concepts

By Erik N. Nilsen

## ABSTRACT

Advanced mission studies are the first step in determining the feasibility of a given space exploration concept. A space scientist develops a science goal in the exploration of space. This may be a new observation method, a new instrument or a mission concept to explore a solar system body. In order to determine the feasibility of a deep space mission, a concept study is convened to determine the technology needs and estimated cost of performing that mission.

Heuristics are one method of defining viable mission and systems architectures, which can be assessed for technology readiness and cost. Developing a viable architecture depends to a large extent upon extending the existing body of knowledge, and applying it in new and novel ways. These heuristics have evolved over time to include methods for estimating technical complexity, technology development, cost modeling and mission risk in the unique context of deep space missions.

This paper examines the processes involved in performing these advanced concepts studies, and analyzes the application of heuristics in the development of an advanced in-situ planetary mission. The Venus Surface Sample Return mission study provides a context for the examination of the heuristics applied in the development of the mission and systems architecture. This study is illustrative of the effort involved in the initial assessment of an advance mission concept, and the knowledge and tools that are applied.

## Information

Paper Type: Full Length

Topic Area: System Architecture

Author: Erik N. Nilsen

Affiliation: Jet Propulsion Laboratory  
Section 313, Spacecraft Systems Engineering

Mail Address: M/S 301-485  
4800 Oak Grove Drive  
Pasadena, CA 91109

E-Mail Address: [erik.n.nilsen@jpl.nasa.gov](mailto:erik.n.nilsen@jpl.nasa.gov)

Telephone: (818)354-4441

Fax: (818)393-6871